Did the Nutrition Labeling and Education Act Affect Food Choice in the United States?

Michael S. Finke, Ph.D.
Assistant Professor
Department of Consumer and Family Economics
University of Missouri

The Food Labeling and Education Act (NLEA) was implemented in 1994 to promote healthier eating by impacting the way consumers compare and value foods. A reduction in fat consumption was among the primary goals of the NLEA, and the single consequence of the Act cited by the Food and Drug Administration (FDA) when estimating monetary benefits of the policy. By comparing the consumption of low-fat diets between 1989, the year prior to enactment of the NLEA, and 1995, the first full year that new food labels were required, it is possible to assess the success of a major public information initiative. Whether consumers made better food choices, and particularly whether more consumers used the new labels and whether those who used the labels in 1995 made more informed choices are questions this study attempts to answer. In addition to providing an analysis of the decision to eat a low-fat diet, a descriptive comparison of label use among consumers is presented to highlight possible changes by age, education and gender.

The NLEA was conceived as a means of improving public health by mandating and updating nutrition information on food package labels and informing consumers of the links between diet and disease. It was assumed that the introduction of more complete and unbiased information, along with an education initiative, would lead to improved diets. Consumers, better able to understand how consumption of a food would affect probability of good health in the future, and better able to make food choices that reflect their valuation of nutrition among other food attributes, would be motivated to buy healthier foods.

A renewed public information focus on consumption of calories from fat as a proportion of total food energy is observed in both legislation related to the NLEA, and in public health objectives (Public Health Service, 1991). The estimated monetary gain from the NLEA by the FDA is based on a decrease in heart disease and cancer as a result of reduced

dietary fat consumption. In addition, as part of the new focus on over-consumption of food energy, the format of the food label was changed to feature fat content among nutrients, with total food energy from fat calculated on the panel to aid comparison.

This study compares consumption of a recommended proportion of dietary fat before and after implementation of the NLEA. The daily recommended value of fat consumption (65 grams) listed on the new food label, as well as stated public nutrition guidelines, correspond to a recommended threshold of fat consumption equal to or less than 30 percent of total food energy. A threshold model, based on the premise that the decision to improve health is comparable to an investment in human capital, is used to measure the odds that explanatory variables will predict consumption of a low-fat diet. Mandatory and clear labels are predicted to allow more efficient production of health, and heightened recognition of the relationship between diet and disease are predicted to improve perception of future gain.

Health Production

The household production model, introduced by Becker (1965), allows economic analysis of non-market, utility-providing activities. Eating a proper diet, jogging, abstaining from smoking, wearing seat belts, and purchasing medical care could be seen as an investment in human capital. Purposeful activity to improve health at the expense of time, enjoyment, or money in the present is explained as an investment in improved quality and duration of life. If time is a resource of value, then an improvement in health is the only controllable way to increase one's allotment of it.

In the last few decades, health has become a recognized and deliberate household production activity. Physical fitness and proper nutrition, or how we maintain and invest in our

bodies, have implications on both the quality and quantity of life. Conscious efforts toward health production help to insure that stocks of human capital and time are available as inputs into all other production activities. In an attempt to explain what consumers demand when they purchase medical services, Grossman (1972) constructs and estimates a model of the demand for the commodity of health. Using Becker's household production framework, Grossman treats health as a durable home-produced commodity in which the level of health of an individual is not exogenous and depends, in part at least, on the resources allocated to its production. An increase in the stock of health reduces the time lost from other market and non-market activities, and the monetary value of this reduction acts as a measure of return to the investment in health as a household production activity.

One's diet provides a number of characteristics, in varying degrees, which contribute to overall satisfaction. Recent public health initiatives have endeavored to increase awareness, and to provide easier and more accurate assessment of the relationship between fat consumption and future well being. Since fat provides flavor, is often associated with convenience foods, and is often a less expensive source of food energy, the decision to eat less of it is assumed to involve a sacrifice undertaken for future benefit. Therefore, the decision to eat a diet lower in fat can be seen as an input into the production of the commodity of health.

Investment in improved health through nutrition is a function of investment in time devoted to improving nutrition, and the cost of eating a more nutritious diet. Consumers will choose to invest in health so long as the marginal cost of investment in health yields as much utility as is yielded by other goods. A change in the technology related to investment in health, for example, by requiring nutrition labels on all foods and making the labels easier to use, will reduce the cost of investing in health through nutrition and result in increased investment. A

household that values future gains due to improved health will be more likely to undertake healthy behavior, a household with greater income will see fewer constraints on investment and those with a higher wage rate will see greater returns to healthy time gained, but a household which produces health less efficiently will undertake less healthy behavior.

It is hypothesized that new food labels will bring about greater health production efficiency and will be associated with the demand for a diet that is less fat dense. Despite results from Guthrie et al. (1995) that find label use does not significantly affect consumption of most food nutrients, choosing foods without the aid of food labels is less efficient. Label use may also be associated with other determinants of human capital, but its independent effect should be a decrease in fat density through more informed decision making.

The ability to gather information, process it, and use it effectively to make more nutritious food choices may be measured by proxy either through education, nutrition knowledge, and/or income. Cole and Balasubramanian (1993) note the difficulty older consumers have processing nutrition information. Urbany et al. (1989) found that the least knowledgeable consumers are also less likely to increase search in response to new information. Mathios (1996) mentions the possibility that income may, to a certain extent, be associated with cognitive ability and may capture an element of processing efficiency not accounted for by education. However, those with a higher wage rate will see a higher cost of investment. Techniques to compare and process nutrition information, and perhaps knowledge gained from course work related to nutrition, may increase with education.

However, studies of health demand (Grossman, 1977) model education as the most appropriate proxy for future discounting. According to human capital theory, the decision to invest in education is a function of discounted gains in future earnings minus the lost wages in

the present and the expense of schooling. Those with lower rates of future discounting will weigh future gains more heavily. Education is seen as a revealed response based on an individual's personal valuation of their own discount rate.

Age is assumed to be inversely related to stock of human capital, and older consumers with a similar rate of discount will have lower future gains to health investment than younger consumers. Similarly, those with a chronic illness or those who estimate their hereditary health stock lower than average should estimate benefits to improved health to occur over fewer time periods.

Nutrition knowledge and awareness of the relationships between foods and health are the most direct indicators of the marginal effects of nutrition investment on health. In addition, being diagnosed with a diet-related disease may also increase awareness of the relationship between diet and disease. Since the consequences of not altering food consumption behavior are so strongly evidenced, these respondents may be inclined to reduce their consumption of fat due to increased awareness.

Sample

Comparison of dietary practices before and after implementation of the NLEA is performed using the 1989 and 1995 Continuing Survey of Food Intakes by Individuals (CSFII). Both surveys were contracted by the U.S. Department of Agriculture to obtain a nationally representative sample. Each survey also sampled a number of main meal preparers to collect data on attitudes and knowledge of food and nutrition called the Diet and Health Knowledge Survey (DHKS). The number of individuals completing the DHKS was roughly the same in 1989 (1,901) and 1995 (1,965). Ten individuals from the 1989 survey were purged due to

incomplete dietary recall data. This study draws heavily on DHKS questions related to food label usage, nutrition knowledge, and attitudes toward food consumption. To maintain the size of the sample and the consistency of data collection procedures, this study uses only dietary data based obtained in the 24-hours prior to the interview.

Empirical Model

The threshold model is chosen as the most appropriate means to measure adherence to recommended fat consumption guidelines. Food energy density from fat is chosen to represent the healthiness of food consumed. The threshold is chosen as 30 percent of total food energy from fat, where an individual who consumes fewer than or equal to 30 percent of total food energy from fat is said to consume a low-fat diet.

Independent variables included in the CSFII are chosen as the best available proxies for factors related to investment in health. These include highest level of education attained, measured as either less than high school, high school degree, some college, or college degree. Age is categorized into physiological life cycle stages. Nutrition knowledge is measured as a score out of 13 questions related to nutrition asked in the DHKS, and as a dichotomous (yes, no) variable according to response to awareness of health problems related to fat consumption. Differences in available response to questions about attitude preference in the two surveys require preference among 6 food attributes be measured as a dichotomous variable of whether the respond felt the characteristic to be “very important” or not. Earned income and unearned income are included as separate categories to capture separately the value of time and access to resources. Responses to questions related to health status are included which include whether the respondent is on a doctor-prescribed low-fat diet, and whether the respondent is currently

vulnerable to or suffering from a diet-related disease. Demographic variables are included which either contribute to investment in health, or which may impact preferences.

Results

A model containing data from both sample years is estimated in order to explore possible shifts in diets between 1989 and 1995. Since labels in 1989 and 1995 are dissimilar, label use is modeled as an interaction between label use frequency and year of survey. Models are also estimated individually for the 1989 (pre-NLEA) and 1995 (post-NLEA) samples in order to capture the effects of independent variable within the sample year. It is important to note that the effect of label use in each year is being compared to the omitted category of respondents in both years who "sometimes" use food labels. In other words, those who often used food labels in 1989 are being compared to those who sometimes used labels in both 1989 and 1995, possibly tempering the effect of the coefficient if mean fat density is higher in one year than the other among those who sometimes used labels. It should be noted that the difference in frequency of low-fat diets between those who sometimes used food labels in 1989 and who sometimes used food labels in 1995 was not statistically significant.

In the combined sample analysis, the survey year is not significantly related to the probability of eating a low-fat diet. In other words, when characteristics related to fat consumption in the data set are controlled (including label use), a respondent in 1995 was no more likely to choose a low-fat diet than a respondent in 1989. Use of food labels in 1995 had a strong and significant positive effect on consumption of a low-fat diet, when compared to respondents who sometimes used food labels. Those who often used food labels in the 1989 sample were not significantly more likely to choose a low-fat diet.

Those who rarely or never used food labels in either sample year were no more or less likely to eat a low-fat diet than respondents who sometimes used food labels.

Respondents who had a college education were more likely to eat a low-fat diet than respondents with lower levels of education. The probability of eating a low-fat diet was significantly lower ($\alpha = 0.01$) for those with some college, high school, or less than a high school level of education. The predicted probabilities of eating a low-fat diet among these lower levels of education were nearly identical - those with some college (33.17) were less likely than high school grads (33.67), but slightly more likely than those with less than a high school education (33.02) to eat a low-fat diet. With all other coefficients set at their mean values, a college graduate is 26.7 percent more likely to eat a low-fat diet than someone who had attended some college (42.01 vs. 33.17).

Age had no significant effect upon the probability of eating a low-fat diet. Earned income had a negative, and significant ($\alpha = 0.05$) effect upon probability of eating a low-fat diet. As earned incomes increased, respondents were less likely to eat a low-fat diet. However, for every $100 change in monthly income, the probability of eating a low-fat diet decreased by only 0.14 percent.

Scores on the 13 question test of nutrition knowledge did not have a statistically insignificant effect upon eating a low-fat diet. Respondents who were aware of a relationship between fat consumption and disease were also no more likely to eat a low-fat diet. Those respondents who considered nutrition "very important" were more likely to eat a low-fat diet ($\alpha = 0.10$), and those who considered how well a food keeps to be "very important" were significantly less likely to eat a low-fat diet ($\alpha = 0.01$). If a respondent considered nutrition very important, they were 10.9 percent more likely to eat

a low-fat diet. Food safety, ease of preparation, importance of price, and taste were not significantly related to eating a low-fat diet.

Demographic characteristics that had a statistically significant impact on probability of eating a low-fat diet were urbanization, region, and household size. There was no significant difference between blacks and non-blacks, or between men and women. Respondents who lived in rural areas were less likely than those living in the suburbs to eat a low-fat diet ($\alpha = 0.05$). Those living in the Northeast were more likely to eat a low-fat diet ($\alpha = 0.10$) than those living in the South, though there was no significant difference among other regions. Respondents who lived in single-person households were more likely ($\alpha = 0.10$) to eat a low-fat diet than respondents who lived in larger households. Being employed full time had no significant impact on eating a low-fat diet. Neither did receiving food stamps or WIC benefits.

A number of health-related factors had a significant impact on eating a low-fat diet. The most significant factor ($\alpha = 0.05$) was having been placed on a low-fat diet by a doctor. Those who were on a doctor-prescribed low-fat diet were 27.8 percent more likely to eat a low-fat diet, though it is interesting to note that the predicted probability of actually eating a low-fat diet is still under 50 percent. Respondents who had been diagnosed with high blood cholesterol, or who considered themselves to be in "poor health" also were significantly ($\alpha = 0.10$) more likely to eat low-fat diets. A diagnosis of high blood cholesterol led to an increase in predicted low-fat diets of 20.8 percent. Diagnoses of diabetes or heart disease did not have a significant impact on probability of eating a low-fat diet. The coefficient was also not significant for women who were pregnant or lactating.

Since the coefficient for those who often used food labels in 1989 was not significant in the combined sample model, a significant coefficient in the 1989 sample (Table 2) is of interest. However, the chi-square statistics of significance are only slightly different between Tables 1 and 2. The fact that the coefficient was compared to those who sometimes used food labels in both surveys may account for this difference in significance, since the frequency of low-fat diets was lower among those who sometimes used labels in the 1989 sample (31.03%) than those who sometimes used labels in the 1995 sample (33.83%). Those who often used food labels were 15.6 percent more likely to eat a low-fat diet than those who sometimes used food labels in the 1989 sample.

Logistic analysis performed on 1995 data alone yields significance at a higher degree of confidence ($\alpha = 0.01$) for those who often use food labels (Table 3). Those who often use food labels were 32.1 percent more likely than those sometimes using food labels to eat a low-fat diet. In fact, predicted probabilities of eating a low-fat diet were 20.1 percent higher for those often using food labels than they had been for those often used labels in 1989. No significant impact was evidenced among those who rarely or never used labels when compared to those who sometimes used labels.

Education was a significant predictor of eating a low-fat diet in both 1989 and 1995. Those with less than a high school education were significantly more likely to higher-fat diets, however the coefficients for those with a high school education in 1995 and those with some college in 1989 were not significantly different from those with a college degree. Predicted probabilities of eating a low-fat diet was highest in both the 1989 and 1995 sample for respondents who had a college degree.

Income, either earned or unearned, had no significant impact on eating a low-fat diet in the 1989 sample. The coefficient for earned income was negatively associated with probability of eating a low-fat diet in the 1995 sample, but the predicted reduced probability (-0.16% per $100) was very small in magnitude.

Differences in the impact of attribute preference on the probability of eating a low-fat diet between the two sample years suggest the increased ability of those who value nutrition to eat a low-fat diet. In the 1989 sample, only those who considered a food's convenience very important were significantly more or less likely to eat a low-fat diet. In the 1995 sample, importance of nutrition was significantly related to probability of eating a low-fat diet.

Among demographic characteristics, region and urbanization were the only variables to have any statistical significance in either survey. In the 1989 survey, living in the Midwest was strongly associated with eating a higher-fat diet in 1989 ($\alpha = 0.01$), compared to living in the South. All other characteristics held at their mean values, living in the Midwest made a respondent 27.6 percent less likely to eat a low-fat diet. Midwesterners were not less likely than Southerners to eat a low-fat diet in the 1995 survey, but North-easterners were 20.7 percent more likely than Southerners to eat a low-fat diet. City and rural residents were not significantly more or less likely than suburbanites to eat a low-fat diet in 1989, but in 1995 rural residents were much less likely to eat a low-fat diet than both urban and suburban respondents. It appears from both multivariate and descriptive analysis that rural residents were essentially just as likely or even less likely to eat a low-fat diet in 1995, while those who lived in or around cities were more likely to eat a low-fat diet.

Among health-related factors, only having been diagnosed with high blood cholesterol ($\alpha = 0.01$) and being in poor health ($\alpha = 0.05$) had a significant, and positive, affect on eating a low-fat diet in 1989. In the 1995 sample, the only health related factor which was statistically significant was having been diagnosed with high blood cholesterol. The strong significance of high blood cholesterol, versus being diagnosed with other diseases, in both samples begs some interpretation. High blood cholesterol is not in itself a disease, it merely marks one vulnerable to disease in the future. This increase in awareness of the relationship between diet and well-being in the future should both lead to an increase in healthy behavior. For this reason, this variable stands among others as evidence that framing nutrition as an investment in human capital is appropriate.

Changes in Label Use

Given the surprisingly strong relationship between often using nutrition labels and consumption of a low-fat diet, it is of interest to note the difference in frequency of label use between 1989 and 1995 among those who often used labels. Table 4 presents the frequency of groups of respondents who often used food labels (label users) in 1989 and 1995, and compares the percentage increase in label use and estimates the significance of increase between the two periods. The rise in label use increased with each level of education. Frequency of label use for those with less than a high school degree increased 35.9 percent, while frequency of label use for those with a college degree increased 54.9 percent. Label use increases were similar among high school grads (52.4%) and those with some college (53.9%).

Just as consistent was the increase in label use from oldest to youngest respondents. Label use increased 79.0 percent among those under 35, and just 31.8 percent among those over 65. Respondents age 35-54 increased their frequency of label use slightly more (56.5%) than those age 55-64 (48.0%). Increases among females in younger age groups was an astounding 116.3 percent within the under 35 age group and 108.7 percent among those women age 35-54. The increases among older women was less than half that of women under 35. For no age group was the change in frequency among men as high as that of any age group for women. The lowest increases in frequency among men were for those over 65 (12.4%) and those aged 35-54 (2.1%).

Increased label use frequency among blacks (38.4%) was lower than the increase among whites (60.1%). Increased label use among city dwellers was 76.43 percent, and increases among suburban and rural respondents was comparable (50.6% & 49.7%). The increase in label use among those who received food stamps was lower (43.0%) than among non-recipients (59.6%). Large and statistically significant changes were also found among single person households (76.9%), respondents who lived in the Midwest (93.6%), respondents following a doctor-prescribed low-fat diet (86.9%), and respondents diagnosed with diabetes (90.7%).

It appears that, as health theory might suggest, increases in use of a new tool which increases health production efficiency are highest among those with greater levels of education and who are younger. Theory does not readily offer an explanation, however, of increased label use among women and non-blacks. Perhaps there are social or cultural explanations for greater acceptance of the new food label.

If policy objectives were only met among those who frequently used food labels, the groups who most benefited most from the policy were women, the more educated, those with a higher earned income, the young, and non-blacks.

Conclusion

Results confirm a strong relationship between education and fat density. This supports the assertion of the health demand model that investment in healthy behavior is related to investment in education - both indicate a willingness to forego satisfaction in the present for increased satisfaction in the future. Perhaps the strongest evidence that the true effect is revealed discounting of education, rather than the knowledge of nutrition, comes from the significantly higher probability of eating a low-fat among college graduates versus those who had attended some college diet. Those who had attended some college and those with a college degree have likely had similar exposure to introductory nutrition courses, but those who dropped out of college made an active assessment that opportunities in the present were more valuable than lost opportunities in the future.

Multivariate results support the conclusion that consumers who often used the 1995 food labels were more likely to eat a low-fat diet than consumers who often used the label in 1989, and that there appears to be little difference in probability of eating a low-fat diet among respondents who rarely, never, or sometimes use food labels. The 1995 food label appears a more effective decision making tool for choosing low-fat diets. The predicted probability of eating a low-fat diet was 13% higher for those who often, rather than rarely, used food labels in the 1989 sample, while often using food labels in the 1995

sample led to a 37% higher predicted probability. In the combined sample model, those who often used food labels in the 1989 survey were not significantly more likely to eat a low-fat diet, but those who often used food labels in the 1995 survey were significantly more likely to eat low-fat diets. These results support the notion that the food label mandated by the NLEA allows consumers to make lower-fat food choices.

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Table 1: Analysis of Respondents Eating a Low Fat Diet Using Logistic Procedure - Combined Sample

Variable (N=3856)	**Coefficient**	**Pr > Chi-Square**	**Predicted Probability (%)**
Intercept	-	***	
Label Use (Sometimes reference category)			30.16
Often, 1995	+	***	40.87
Often, 1989	+		34.61
Rare, 1995	-		28.58
Rare, 1989	+		31.19
Never, 1995	+		30.44
Never, 1989	+		30.55
Year (1989 reference category)			34.00
1995	+		35.55
Education (College reference category)			42.01
Some College	-	***	33.17
High School	-	***	33.67
Less than High School	-	***	33.02
Age (Age 35-54 reference category)			33.61
Age Less than 35	+		34.61
Age 55 - 64	+		34.06
Age over 64	+		36.83
Income			
Earned	-	**	-0.14[†]
Unearned	-		-0.02[†]
Information Skills			
Nutrition Knowledge	+		0.04
Awareness	-		34.68
Food Assistance			
Food Stamps	-		34.66
WIC	+		41.44

[†]For every $100 change in income

(continued)

Table 1 (continued)

Variable (N=3856)	Coefficient (Std Error)	Pr > Chi-Square	Predicted Probability
Attribute Preference			
Taste	+		34.92
Nutrition	+	*	36.06 vs 32.52
Shelf Life	-	**	33.31 vs 37.16
Convenience	+		35.63
Safety	+		35.40
Price	-		34.35
Demographics			
Male	-		32.95
Black	-		34.69
Region (South reference category)			35.92
Northeast	-	*	32.17
Midwest	-	*	32.25
West	+		38.93
Urbanization (Suburban reference category)			35.38
City	+		37.48
Rural	-	**	31.25
Not Employed Full Time	+		35.07
Single Person Household	+	*	37.30 vs 33.94
Health Related Factors			
Low Fat Diet - Doctor	+	**	43.99 vs 34.48
Diabetes	-		30.82
High Blood Pressure	+		35.24
Heart Disease	-		34.36
High Blood Cholesterol	+	***	40.81 vs 33.79
Poor Health	+	*	41.96 vs 34.45
Pregnant/Lactating	-		29.58

* indicates significance at the α=0.10 level
** indicates significance at the α=0.05 level
*** indicates significance at the α=0.01 level

Table 2: Analysis of Respondents Eating a Low Fat Diet Using Logistic Procedure - 1989 Sample

Variable (N=1891)	Coefficient (Std Error)	Pr > Chi-Square	Predicted Probability
Intercept	-		
Label Use (Sometimes reference category)			31.57
Often	+	*	36.50
Rare	+		32.23
Never	-		31.55
Education (College reference category)			41.54
Some College	-		35.11
High School	-	***	30.53
Less than High School	-	**	30.80
Age (Age 35-54 reference category)			31.49
Age Less than 35	+		32.42
Age 55 - 64	+		33.16
Age over 64	+		34.44
Income			
Earned	-		-0.11†
Unearned	-		-0.09†
Information Skills			
Nutrition Knowledge	-		-0.60
Awareness	-		32.54
Food Assistance			
Food Stamps	-		30.91
WIC	+		48.45
Attribute Preference			
Taste	+		33.69
Nutrition	+		32.86
Shelf Life	-		31.55
Convenience	+	*	35.61 vs 30.91
Safety	+		33.65
Price	-		31.68

†For every $100 change in income

(continued)

Table 2 (continued)

Variable (N=1891)	Coefficient (Std Error)	Pr > Chi-Square	Predicted Probability
Demographics			
Male	-		30.84
Black	-		30.78
Region (South reference category)			35.06
Northeast	-		34.58
Midwest	-	***	25.40
West	+		35.51
Urbanization (Suburban reference category)			31.82
City	+		35.35
Rural	-		31.49
Not Employed Full Time	+		34.37
Single Person Household	+		34.15
Health Related Factors			
Low Fat Diet - Doctor	+		39.18
Diabetes	-		30.61
High Blood Pressure	+		33.60
Heart Disease	-		32.49
High Blood Cholesterol	+	**	41.88 vs 31.68
Poor Health	+	**	45.79 vs 32.10
Pregnant/Lactating	-		29.63

* indicates significance at the α=0.10 level
** indicates significance at the α=0.05 level
*** indicates significance at the α=0.01 level

Table 3: Analysis of Respondents Eating a Low Fat Diet Using Logistic Procedure - 1995 Sample

Variable (N=1965)	Coefficient (Std Error)	Pr > Chi-Square	Predicted Probability
Intercept	-	**	
Label Use (Sometimes reference category)			33.17
Often	+	***	43.83
Rare	-		32.05
Never	+		34.14
Education (College reference category)			42.69
Some College	-	***	32.01
High School	-		37.32
Less than High School	-	*	34.89
Age (Age 35-54 reference category)			35.95
Age Less than 35	+		37.15
Age 55 - 64	-		35.49
Age over 64	+		38.45
Income			
Earned	-	*	-0.16†
Unearned	-		-0.01†
Information Skills			
Nutrition Knowledge	+		0.60
Awareness	-		36.69
Food Assistance			
Food Stamps	+		39.84
WIC	-		21.52
Attribute Preference			
Taste	-		36.27
Nutrition	+	**	38.93 vs 32.86
Shelf Life	-	*	34.95 vs 39.79
Convenience	-		36.15
Safety	+		37.13
Price	+		37.03

†For every $100 change in income

(continued)

Table 3 (Continued)

Variable (N=1965)	Coefficient (Std Error)	Pr > Chi-Square	Predicted Probability
Demographics			
Male	-		35.21
Black	+		37.63
Region (South reference category)			34.06
Northeast	+	**	41.11
Midwest	+		35.88
West	+		38.91
Urbanization (Suburban reference category)			38.32
City	+		40.19
Rural	-	***	30.75
Not Employed Full Time	+		38.97
Single Person Household	+		39.50
Health Related Factors			
Low Fat Diet - Doctor	+		58.16
Diabetes	-		31.27
High Blood Pressure	-		36.49
Heart Disease	-		36.18
High Blood Cholesterol	+	*	41.50 vs 35.74
Poor Health	+		37.51
Pregnant/Lactating	-		25.65

* indicates significance at the α=0.10 level
** indicates significance at the α=0.05 level
*** indicates significance at the α=0.01 level

Table 4: Unweighted Frequencies of Respondents Who Often Use Food Labels

Variables (Percent)	1989	1995	% Change	Difference	
Sample	21.89	34.71	58.57		***
Education					
Less than High School	18.92	27.92	35.94		***
High School	19.08	29.07	52.36		***
Some College	24.53	37.75	53.89		***
College	32.58	50.45	54.85		***
Age					
Less than 35	15.82	28.32	79.01		***
35 - 54	24.37	38.14	56.50		***
55-64	25.61	37.89	47.95		***
Over 65	24.12	31.79	31.80		***
Gender					
Male	19.85	26.88	35.42		***
Female	22.42	42.59	89.96		***
Gender and Age					
Males < 35	10.09	19.86	96.83		**
Females < 35	17.17	37.14	116.31		***
Males 35 - 54	27.05	27.61	2.07		
Females 35 - 54	23.67	49.40	108.70		***
Males 55 - 64	17.54	32.31	84.21		**
Females 55-64	28.04	43.52	55.21		***
Males Over 65	23.00	25.86	12.43		
Females Over 65	24.42	37.26	52.58		***
Race					
Black	18.47	25.56	38.39		*
Non-black	22.41	35.88	60.11		***
Urbanization					
City	20.58	36.31	76.43		***
Suburban	24.20	36.44	50.58		***
Rural	19.93	29.84	49.72		***
Food Stamps					
Recipient	20.70	29.61	43.04		**
Non-Recipient	22.06	35.22	59.66		***
Aware of Fat/Disease					
Yes	24.07	37.51	55.84		***
No	16.96	15.54	(8.37)		

(continued)

Table 4 (Continued)

Variables (Percent)	1989	1995	% Change	Difference
Attribute Preference				
Taste	22.71	33.98	49.63	***
Price	20.42	31.53	54.41	***
Safety	25.63	38.03	48.38	***
Nutrition	29.41	41.75	41.96	***
Shelf Life	25.38	35.38	39.40	***
Convenience	23.97	35.09	46.39	***
One Person Household				
Yes	20.04	35.44	76.85	***
No	22.59	34.46	52.55	***
Region				
Northeast	27.23	35.91	31.88	***
Midwest	18.25	35.33	93.59	***
South	20.35	32.56	60.00	***
West	23.65	36.89	55.98	***
Low Fat Diet - Doctor				
Yes	38.21	71.43	86.94	**
Health Status Poor				
Yes	25.53	29.17	14.26	
Diabetes				
Yes	21.68	41.34	90.68	***
High Blood Pressure				
Yes	23.44	35.48	51.37	***
Heart Disease				
Yes	28.57	31.91	11.96	
High Cholesterol				
Yes	30.92	43.75	41.40	***
Pregnant/Lactating				
Yes	17.65	43.75	147.88	**

* indicates significance at the α=0.10 level
** indicates significance at the α=0.05 level
*** indicates significance at the α=0.01 level